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SELECTION OF ONCOPLASTIC SURGERY IN UZBEKISTAN REGION BREAST CANCER PATIENTS

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ABSTRACT

Breast cancer is a common disease affecting millions of women, often at a relatively young age. Every tenth woman in the Uzbekistan develop breast cancer during her lifetime; 2.5 million women survive annually after treatment, and a significant increase in the number of such patients is expected in the coming decades.¹ Reconstruction after a mastectomy enables women to alleviate the emotional and aesthetic defect of this severe illness. Successful breast surgery virtually eliminates a postmastectomy psychosocial defect - this is the main disabling factor. Oncoplastic surgery is increasingly performed in Uzbekish women; Uzbekish women usually have normal-big to moderate-sized breasts. To achieve better outcomes in reconstructed breasts, several factors determining the optimal surgical method should be considered.

Methods: A total of 135 patients who underwent oncoplastic surgery from September 2015 to November 2019 were retrospectively investigated. We used various methods, including glandular tissue reshaping, latissimus dorsi (LD) flap transposition, and reduction oncoplasty to restore the breast volume and symmetry.

Results: The mean weight of the tumor specimen was 40.46 g and tumor specimen to breast volume ratio was 0.12 g/cc in the glandular tissue reshaping group (n=59), 101.47 g and 0.14 g/cc in the reduction oncoplasty group (n=17), and 82.54 g and 0.20 g/cc in the LD flap

group (n=44). Glandular tissue reshaping was mostly performed in the upper outer quadrant and LD flap transposition in the lower inner quadrant. No major complications were noted. Most patients were satisfied with the aesthetic results.

Conclusion:

We had satisfactory outcomes of oncoplastic surgeries in Uzbekish patients. The results about specimen weight and tumor to breast ratio of Uzbekistan region patients will be a helpful reference to determine the method of oncoplastic surgery.

Keywords: TDL flap, oncoplastic surgery, breast cancer, tumor, latissimus dorsi flap, surgical treatment, radical mastectomy.

INTRODUCTION

Iginio Tansini [1] first described the latissimus dorsi muscle flap in 1906, but the technique did not gain popularity in breast reconstruction until the 1970s. [2] In the interim, William Halsted's radical mastectomy procedure, with skin grafting or closure by secondary intention of the resulting defect, defined the gold standard for breast surgery and reconstruction. [3] In 1977, Schneider et al [4] described the anatomy of the latissimus dorsi flap (LDF) and its use with implant-based reconstruction in a 31-year-old woman who underwent radical mastectomy 4 years prior. The latissimus dorsi helped to restore form and function by providing muscle coverage over the implant, replacing the breast skin and creating a natural ptosis. In subsequent years, numerous variations of the LDF were described for breast reconstruction. In 1978, Bostwick et al [5] described the use of a skin island over the muscle to replace defects of the skin in reconstruction after radical mastectomy. These techniques required an implant to replace volume, with the latissimus flap providing muscle coverage of the silicone implant and breast skin replacement. Papp and McCraw [6] developed a de-epithelialized latissimus flap as a volume replacement technique in 1983. Various techniques were designed to create an "extended" LDF, with the aim of bringing additional tissue to circumvent implant use. The first such flap was described in 1983 by Hokin and Silfverskiold, who included lumbar fat extensions. [7] In 1985, Papp and McCraw [6,8] modified the design to carry fat on the surface of the latissimus muscle, thus creating the total autogenous latissimus breast reconstruction.

Concurrent to these developments in the LDF, the transverse rectus abdominis muscle (TRAM) flap was being developed for autologous breast reconstruction. Described in 1982 by Hartrampf et al, [9] the TRAM overtook the LDF as the primary modality for autologous breast reconstruction. A decade later, Allen and Treece described the first successful distal inferior epigastric perforator (DIEP) flap breast reconstruction, adding another technique to the autogenous breast reconstruction armament. [10] However, the LDF offers a reliable alternative for autologous breast reconstruction and remains a mainstay of breast surgery in several specific situations. There are several specific indications for the LDF. [3] For autogenous breast cancer reconstruction, the LDF is first line for patients who are not candidates for the TRAM flap, due to previous abdominoplasty, prior TRAM, insufficient abdominal skin or fat, and high-risk comorbidities such as diabetes, obesity, or tobacco use. In patients whose breasts have been radiated, the LDF can be used to provide well-vascularized tissue to the ischemic chest wall. The LDF can also provide tissue to correct partial mastectomy or lumpectomy defects, to augment thin or unreliable skin flaps over an implant, or to maximize aesthetic outcome of a prophylactic mastectomy. Relative contraindications to the use of the latissimus muscle are a posterior lateral thoracotomy where the muscle and its blood supply was previously divided or division of the thoracodorsal nerve during an axillary node dissection, resulting in an atrophic muscle. Recently, breast-conserving surgery (BCS) is increasingly performed worldwide. The prognosis after total mastectomy or BCS with adjuvant radiation therapy in patients with breast cancer was proven equal in early stage breast cancer. [1] The aesthetic outcome of the surgery as well as the oncologic outcome is important to most patients. Even though aesthetic techniques have

improved, 4%–20% of patients who undergo BCS may still be dissatisfied with their aesthetic outcome. [2] Oncoplastic surgery was first introduced in 1998 to improve both aesthetic and oncologic outcomes. [3] The location of the tumor and tumor to breast size ratio are known to be important factors in selecting the reconstruction method. The latissimus dorsi muscle is a flat, triangular muscle that covers the posterior trunk, with its superior medial portion resting deep to the trapezius muscle and its remainder directly under subcutaneous tissue. The muscle origins include the external surface of the 3rd or 4th most inferior ribs, the iliac crest, the spinous processes of the lower 6th or 7th thoracic, lumbar, and superior sacral vertebrae, as well as the inferior angle of the scapula. The muscle fibers run toward the axilla, where they insert as the broad tendon into the intertubercular groove of the humerus. Of note, the latissimus dorsi muscle fibers form an aponeurotic attachment with the lower border of the serratus anterior and superiorly converge with fibers of the teres major to form the posterior axillary fold. The latissimus dorsi functions to adduct, extend, and medially rotate the humerus, as well as secure the tip of the scapula against the posterior chest wall. [3] The muscle is expendable; its functions are preserved in its absence by the shoulder girdle muscles (Figure 1). Mathes and Nahai classified the latissimus dorsi muscle as type V12 ; its dominant pedicle is the thoracodorsal artery, and the muscle receives segmental circulation from perforators off of the posterior intercostal arteries and the lumbar artery. [3,12] (What part of statement is from Ref 2 as that publication is not by Mathes and Nahai.) With a large diameter and minimal anatomic variation, the thoracodorsal artery provides a highly reliable blood supply. [3,12,13] The vessel enters the underside of the latissimus in the posterior axilla, giving off a branch to the serratus muscle, continues into the muscle and bifurcates into a large lateral descending branch and small transverse branch. [3] In addition, numerous musculocutaneous perforators allow for skin island design anywhere on the muscle. Operative Technique The goal of optimal operative technique is to maximize the soft tissue coverage provided by the flap, while minimizing the magnitude of donor site defect and donor site complications. Markings are performed preoperatively with the patient in the upright position and anteriorly include the midline, inframammary fold and lateral edge of breast tissue and posteriorly include lateral margin of the latissimus along the posterior axillary line, superior margin at the tip of the scapula, and inferior margin at the iliac crest (Figure 2). The skin paddle may be designed transversely, obliquely, or vertically; each orientation carries advantages and disadvantages for dissection, tissue harvest, and ultimate scar.

In the operating room, the patient is placed in the lateral decubitus position for unilateral or prone position for bilateral flap elevation. Dissection is carried out beneath the thoraco-lumbar fascia, leaving the deep fat attached to the back skin flaps. The latissimus is separated from the serratus anterior at the lateral border; from the paraspinous muscle fascia, lumbo-sacral fascia, and vertebral column; from the trapezius fibers superomedially; and from the teres major fibers in the axilla. After identification of the thoracodorsal vessels, the latissimus is divided near its attachment to the humerus. The myocutaneous or myofascial flap is then transferred to the mastectomy defect through a subcutaneous tunnel in the axilla. [3] (Figure 3) There are several techniques to minimize breast deformities. The first method is the volume displacement technique, which rearranges the position of the breast parenchyma via glandular tissue reshaping or reduction oncoplasty technique. [5] This method is less invasive and does not leave donor site morbidity. However, the glandular tissue reshaping technique is usually applicable only to small-sized defects, and reduction oncoplasty may need a contralateral procedure. Further, reconstructed breasts are smaller than preoperative breasts. The second method is the volume replacement technique, which uses autologous tissues to compensate insufficient volumes via methods using local or distant flaps, e.g., intercostal artery perforator flap or latissimus dorsi (LD) myocutaneous flap. The patient is then placed in the supine position, and the surgeon proceeds with flap placement according to the type of reconstruction. When a tissue expander is to be used in a 2- stage reconstruction, the expander can be placed between the latissimus and the

pectoralis major or deep to both muscles. The latter placement can allow additional aesthetic freedom.

For example, the pectoralis major can provide upper pole coverage and the latissimus placed inferiorly can create a natural ptosis. The latissimus is then sutured medially and inferiorly to the underlying muscle and fascia. Additional sutures placed along the anterior axillary line aid in preventing flap or implant migration as well as protect the pedicle from excess tension. In a total autogenous LDF, the cutaneous paddle is molded into the form of an asymmetric U, with the distal fat and muscle folded under to create the desired volume and projection of the breast. ³ This method is usually used for moderate- to large-sized defects and can restore the preoperative breast shape. However, it may result in donor site morbidity and needs longer operating time. In Western countries, where most patients have moderate- to large-sized breasts, the resected tumor specimen weight tends to be higher than that of Uzbekistan women. In the studies by Losken et al. and Clough et al., on Western patients, each mean tumor specimen weight after partial mastectomy was 223 g and 213 g, respectively. [6,7] However, in Uzbekistan, where patients tend to have moderate- to normal and big l-sized breasts, the tumor specimen weight is also usually higher than that of Western patients. The race-based differences in the characteristics of the breasts necessitate a new paradigm of oncoplastic surgery that is different from the conventional Western-oriented approach. In this study, we retrospectively investigated methods of reconstruction performed after partial mastectomy according to the weight and location of the tumor in Uzbekish patients. We aimed to suggest our clinical outcomes about oncoplastic surgery and objective data to help determine the method of oncoplastic surgery, especially for Uzbekistan region breast cancer patients.

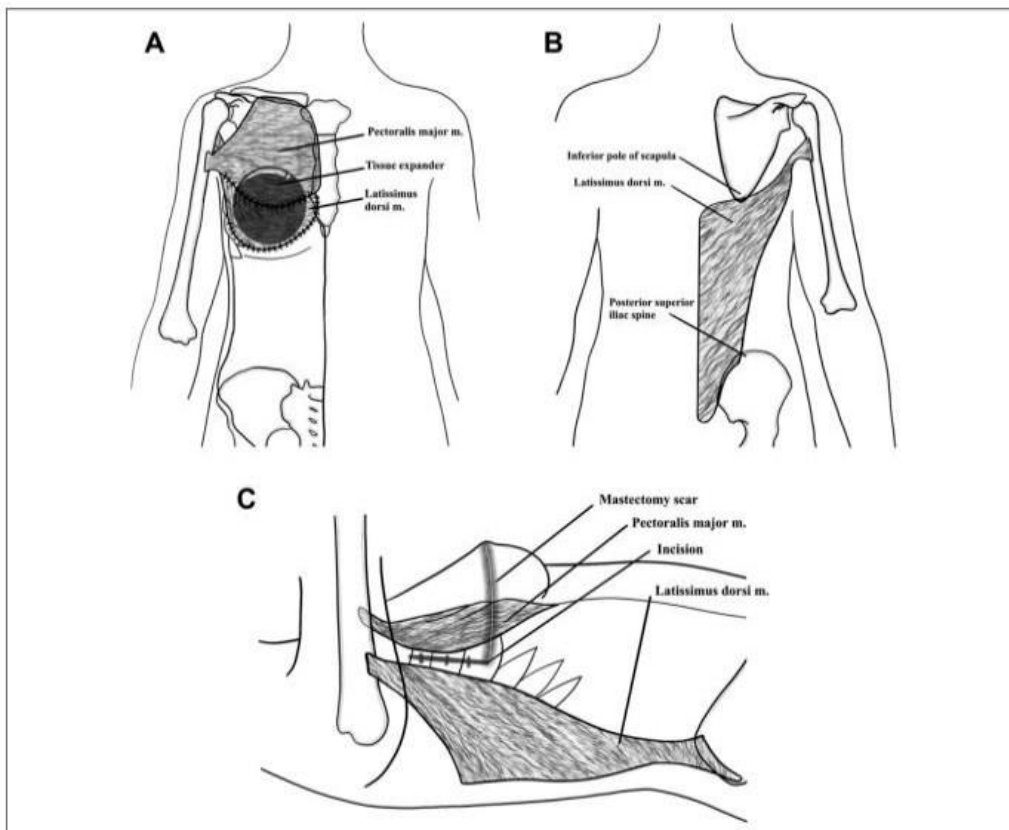


Figure 1. Schematic of relevant anatomy of the latissimus dorsi flap for breast reconstruction: (A) anterior, (B) posterior, and (C) lateral views.

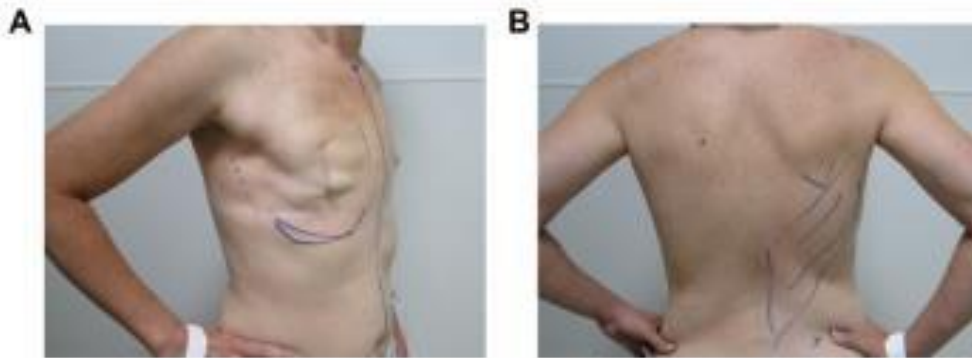


Figure 2. Preoperative markings. A patient after bilateral mastectomies and right chest wall radiation presents for a right latissimus dorsi flap and bilateral tissue expander placement. A, Midline, inframammary fold, medial and lateral extents of breast mound. Note prior mastectomy scar and proposed extension of incision for posterior access to latissimus dorsi. B, Tip of scapula, extent of latissimus dissection and iliac crest.

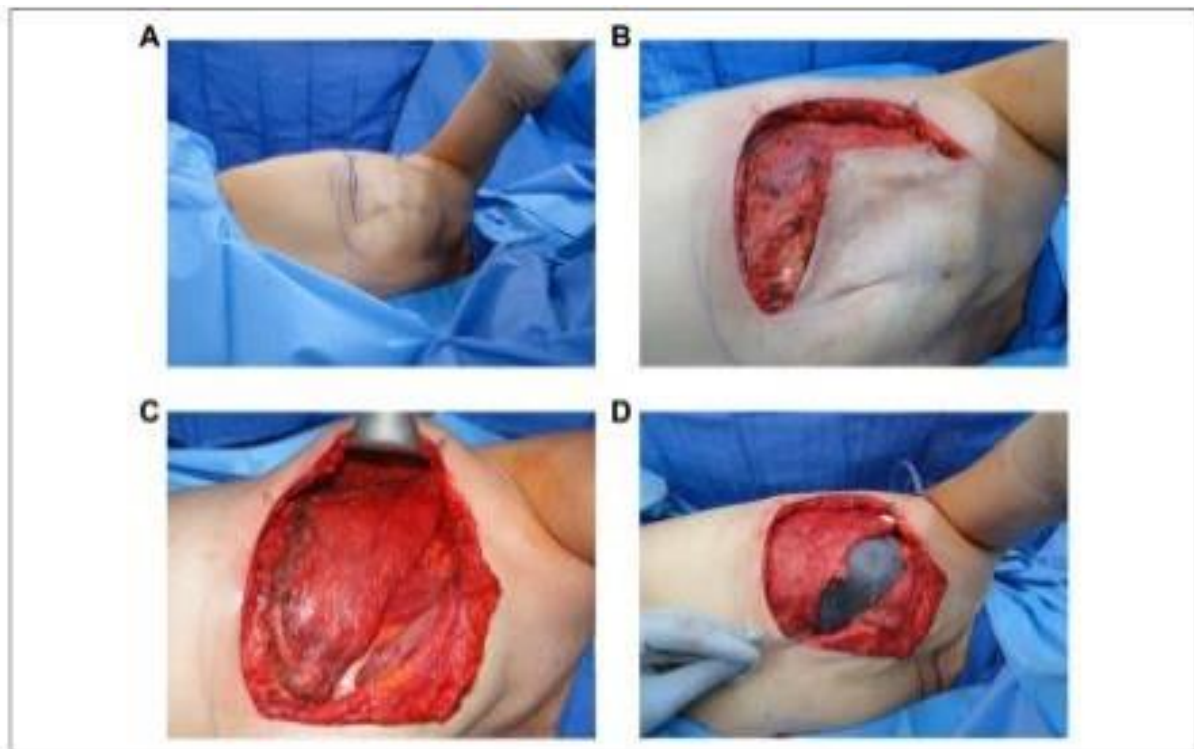


Figure 3. Intraoperative photos. A, Patient in the left lateral decubitus position for access to latissimus dorsi flap dissection. B, Initial dissection raising prior mastectomy flap off of the pectoralis major. C, Latissimus dorsi flap rotated anteriorly to the chest wall into proposed position. D, Tissue expander placed within latissimus sling. Next pectoralis major (retracted cephalad) will be sutured to latissimus to provide complete coverage of the expander.

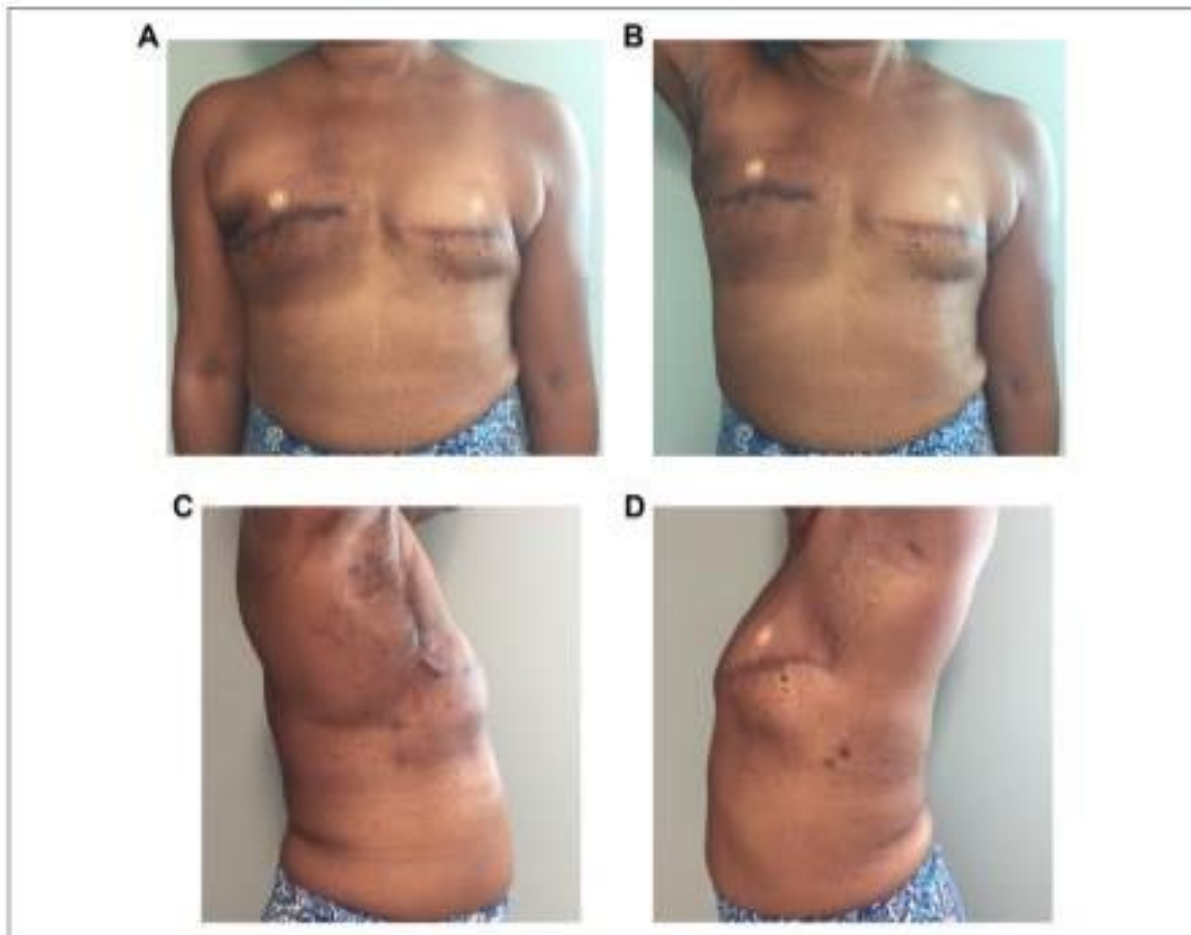


Figure 4. Postoperative photos. A patient after a right “scarless” latissimus dorsi flap and bilateral tissue expander placement. A, Frontal view. B, Frontal view with right arm raised. C, Right lateral view. D, Left lateral view. This technique removes the need for a posterior donor site scar through a small lateral extension of the mastectomy incision

Patients & methods

Patients

A total of 135 patients who underwent BCS by an oncologic breast surgeon underwent an immediate oncoplastic breast surgery from 2015 to 2019. We conducted pre-operative interviews with the patients who decided to undergo partial mastectomy by a general surgeon. We explained to the patients that at the end of partial mastectomy, we will decide whether to perform partial reconstruction based on the judgement of the plastic surgeon and oncologic surgeon, considering the defect size, specimen weight, amount of frozen section examination, tumor location, preoperative breast size, breast shape, and expected degree of breast deformity.

Reconstruction options

The major reconstruction options offered before surgery were the volume displacement techniques (i.e., glandular tissue reshaping and reduction mammoplasty) and volume replacement techniques (i.e., LD flap transposition). In this study, those who underwent glandular tissue reshaping were classified into group 1, those who underwent LD flap transposition into group 2, and those who underwent reduction oncoplasty into group 3.

During the oncologic surgery, an intraoperative frozen section analysis for cancer margin and sentinel lymph node assessment were performed. If the partial mastectomy was judged sufficient to treat the breast cancer without performing total mastectomy, based on the frozen section analysis results, the oncologic surgery was completed via partial mastectomy. At the end of partial mastectomy, the plastic surgeon was requested to decide whether an oncoplastic

surgery was required by the oncologic surgeon. In general, the decision to perform an oncoplastic surgery was made by the plastic surgeon after confirming the appearance of the breast after the oncologic surgery. If necessary, the plastic surgeon decided whether to perform glandular tissue reshaping or LD flap transposition according to the characteristics of the defect. Reduction oncoplasty was performed on a patient who had a large, ptotic breast before the surgery and wanted to reduce her breast size bilaterally. Reduction mammoplasty was automatically performed on the contralateral side after partial mastectomy.

Surgical techniques

Glandular tissue reshaping involves conceptually covering the parenchymal defect by undermining [5] surrounding glandular tissues and suturing adjacent glandular tissues or transposing surrounding glandular tissues to the defect. After partial mastectomy, the adjacent parenchymal tissue was separated from the chest wall fascia and skin by the plastic surgeon. Thereafter, glandular tissue advancement was attempted, and if possible, the surgery was completed. However, if not, further glandular tissues were separated from the chest wall fascia and overlying skin, considering the result of the flap rotation. It was important that the flap be elevated to avoid affecting the blood supply of the glandular flap. The elevated flap was rotated or transposed from one side or both sides from the defect. After suturing the glandular tissues, skin dimpling or remnant breast deformity was checked for carefully. Reduction oncoplasty was performed using wise pattern or vertical pattern incision depending on the tumor location. Generally, the pedicle opposite to the tumor was selected. Defects of upper pole area were reconstructed using inferior pedicled technique and wise patterns skin incision. Defects of lower pole area were mainly reconstructed using vertical superomedialmastopexy technique. Using the incision, tumor removal was possible from any quadrant by the oncologic surgeon. A new nipple areolar complex location and amount of skin to be excised were planned before surgery, using a preoperative design, considering the breast volume, ptosis degree, height, and weight. Through this method, the nipple areolar complex and dermoglandular flap could be safely supplied with blood through a virtual pedicle (superior, medial, and inferior), and a significant amount of breast tissue and excessive skin could also be removed. Consequently, the breast shape was aesthetically improved. The ipsilateral breast was generally made ~10% larger to allow for radiation fibrosis.

The contralateral breast was also reduced using the same technique. The LD flap is used as a volume replacement technique in our institution. After partial mastectomy, the thoracodorsal pedicles were identified, and the thoracodorsal nerve was ligated. The LD muscle origin and part of the lateral LD muscle were also divided. Thereafter, laparotomy sponge packing was performed on the defect to determine the required volume; the volume was then compared with that of the contralateral breast. The patients' position was then changed to the lateral decubitus position. The design of LD muscle and skin paddle was drawn before creating an incision on the back. If large volume of LD flap was required, the design was made to contain enough skin paddle. After creating the incision, dissection between the skin and LD muscle was performed. Dissection was performed beneath Scarpa fascia in case of large defect, and deep fat tissues underneath Scarpa fascia was attached on the LD muscle. If defect size was relatively small, dissection was performed along the muscular fascia of latissimus dorsi. LD muscle was dissected to the superior direction with the thoracodorsal pedicle located underneath. After complete dissection, the LD flap supplied by the thoracodorsal pedicles was shifted to the breast defect. Meticulous bleeding control and saline irrigation was performed. Two negative drainage tubes were inserted, and multiple quilting sutures were used in the LD donor site. Fibrin sealants (Tissel, Baxter International Inc., Utica, NY, USA) were sprayed within the cavity and manual pressure was applied to donor site for 3 minutes to eliminate dead space. The back incision was repaired layer by layer. After changing to the sitting position, flap inseting was performed and two negative drainage tubes were inserted in the reconstructed breast. Remnant skin paddle attached on LD flap was deepithelized and buried into the defect to fulfill the volume of flap.

Assessment

The medical charts of the patients were reviewed retrospectively. Their demographic data, including age, sex, histologic cancer type, tumor node metastasis (TNM) stage, tumor location, chemotherapy history, and radiotherapy history were also investigated. The preoperative breast volume of all patients was recorded using a 3D camera (XS-400; Axis Three, AX3 Technologies LLC., Miami, FL, USA). Data during the surgeries, including specimen weight and oncologic surgery method, were also recorded. The weight of tumor specimen was measured in the operating room immediately after the surgeon removed the tumor. Data about contralateral procedures and complications during follow up periods were also recorded. The tumor-to-breast ratio was calculated by dividing the weight (g) of tumor specimen measured in the operation room by the volume (cc) of the breast measured by a 3D camera. The patients had postoperative regular follow ups at time of 3 months, 6 months, 1 year, 2 years and 3 years. They were asked about their satisfaction with the postoperative cosmetic outcome during the outpatient clinic visit. On average, postoperative aesthetical satisfaction survey was performed at 12 months after surgery, usually at 8 to 9 months after end of radiotherapy.

The scores ranged from 0 to 10, which indicates that 0-2 to be poor, 2-4 not good, 4-6 fair, 6-8 good, 8-10 excellent.

Recent Innovations

This paper's senior author (Z.P.) as well as others [14,15] have developed a "skinless" approach, which avoids taking a skin paddle to complete staged reconstruction with a muscle flap alone. This method is ideal for relatively thin mastectomy patients who are unsuitable for abdominal tissue transfer but have had radiation to the chest wall. The procedure is usually combined with a tissue expander but may also be used in single stage with an implant.

This "skinless" approach has many benefits. First, the technique removes the need for a posterior donor site scar through a small lateral extension of the mastectomy incision (Figure 4).

In addition, there is no skin mismatch from the donor to the recipient site. In the advent of skin-sparing and nipple-sparing mastectomies combined with effective submuscular tissue expansion, this "skinless" approach serves as a beneficial alternative in breast reconstruction. [14,15] A retrospective chart review of our institution's patients who underwent 2-stage reconstruction using the scarless and skinless LDF between 2015 and 2019 was conducted. We reviewed a total of 135 procedures in 135 patients. Our results are notable for overall excellent patient satisfaction and low donor site morbidity. Our cohort had 2 postoperative donor site seromas, both of which were managed nonoperatively with serial aspiration and one instance of failed reconstruction with expander exposure secondary to infection. These results are comparable to a 32.8% postoperative complication rate described in a French cohort of 121 patients undergoing 2-stage scarless LDF and tissue expander reconstruction following prior radiotherapy. [16] One of the shortcomings and criticisms of the traditional LDF is that the skin island overlying the flap is difficult to orient properly for successful breast volume replacement in reconstruction while providing good muscle coverage from the latissimus muscle. More recently, the thoracodorsal artery perforator (TDAP) tissue has been described, with or without the latissimus muscle for volume replacement of either partial or total breast tissue defects. [17,18] The TDAP flap utilizes the residual lateral lipodystrophy tissue often present after a mastectomy as autologous tissue for breast cancer reconstruction. This not only results in volume augmentation for breast reconstruction but also removes the dystrophic fat below the axilla. The senior author (Z.P.) has performed 14 such procedures in 11 patients with good results. The procedure may be combined.

Results

From 2015 to 2019, a total of 625 patients underwent partial mastectomy after consultation with a plastic surgeon, and 135 patients underwent oncoplastic surgery. The percentages of patients who underwent oncoplastic surgery are listed in Table 1. In 517 patients from among the 625 patients (82.72%) who underwent preoperative interviews with the plastic surgeon, surgery was terminated by the general surgeon. In 135 patients, 59 patients (54.63%) underwent

glandular tissue reshaping (Fig. 5); 17 patients (15.74%) underwent reduction oncoplasty (Fig. 6); and 49 patients (29.63%) underwent LD flap transposition (Fig. 7). Among the 49 patients who underwent LD flap transposition, 14 (12.96%) underwent endoscopic-assisted LD flap transposition because they needed a less flap volume. The data from the 135 patients who underwent oncoplastic surgery after BCS, including tumor location and specimen weight, were collected. The demographic data of the patients are shown in Table 2. Their age ranged from 28 to 55 years, and their mean age was 47 years. The mean follow-up period was 17 months. The cancer stage of the patients ranged from 0 to IIB according to the TNM staging system by the American Joint Committee on Cancer. The most frequent histologic cancer type was invasive ductal carcinoma (65 cases, 60.2%). Postoperative radiotherapy was performed in 125 patients (92.6%). Neoadjuvant chemotherapy was administered in 7 patients (5.5%); 51 patients (38%) received adjuvant chemotherapy, and 77 patients (56.5%) did not receive chemotherapy.

The preoperative breast volume was recorded using the 3D camera (Table 3). The mean preoperative breast volume of the 135 patients was 513 cc when only the cancer region side was calculated. The mean preoperative breast volume was 432 cc in group 1, 705 cc in group 2, and 401 cc in group 3, according to the oncoplastic surgical method. Tumor locations and specimen weights are shown in Table 4. The mean entire tumor specimen weight was 62.31 g (range, 4–410 g). The mean tumor specimen weight was 40.46 g in group 1, 101.47 g in group 2, and 82.54 g in group 3 (Table 4). Tumor location distribution is also shown in Table 4. When we divided the breasts into quadrants, most of the tumors (49.1%) were located on the upper outer quadrant (quadrant 1) in group 1. In group 3, most tumors (31.3%) were located on the lower inner quadrant (quadrant 4). In group 2, most tumors (58.8%) were located on the upper outer quadrant (quadrant 1). Tumor to breast ratio are shown in Table 4. As mentioned above, ratio (g/cc) was calculated by dividing the specimen weight (g) by the breast volume (cc).

Ratio of each group was 0.12 in group 1, 0.14 in group 2, 0.20 in group 3. When we investigated the complications, 2 (11.7%) minor wound breakage cases were noted in group 2, which [8] were treated by conservative treatments. Six (18.7%) seroma cases in the donor site were noted in group 3, which were cured by repetitive needle aspirations during the outpatient follow-up visit. All seromas were resolved within 6 weeks after surgery. Complications such as flap necrosis and wound infection did not occur. During the follow up period, contralateral procedures or revisional procedures were not performed in all cases. The mean postoperative aesthetic degree of satisfaction was 8.3 in group 1, 8.7 in group 2, and 8.1 in group 3.

This indicates that most patients were satisfied with their results.

Table Footnotes

Table 1. Percentage of patients who underwent oncoplastic surgeries

	Number (%)
Oncoplastic surgery	135 (100)
Glandular tissue reshaping	74 (54.63)
Reduction oncoplasty	21 (15.74)
LD flap transposition (Endoscopic-assisted LD flaptransposition)	40 (29.63)
LD, latissimus dorsi	

Table 2.Characteristics of breast cancer

Characteristics	Values (%)
Location	
Left	76 (56.4)
Right	59 (43.6)
Pathology	
Invasive ductal carcinoma	81 (60.2)
Ductal carcinoma in situ	27 (20.4)
Invasive lobular carcinoma	7 (5.5)
Lobular carcinoma in situ	5 (3.7)
Phyllodes tumor	3 (1.9)
Mucinous carcinoma	5 (5.5)
Tubular carcinoma	3 (1.9)
Invasive micropapillary carcinoma	4 (4.6)
Tumor Node Metastasis stage (except phyllodes tumor)	
0	33 (24.5)
IA	61 (45.3)
IB	1 (0.9)
IIA	29 (21.7)
IIB	6 (4.7)
IIIA	4 (2.8)
IIIB	0
IV	0
Radiotherapy	
Preoperative	1 (0.9)
Postoperative	125 (92.6)
None	9 (6.5)
Chemotherapy	
Neoadjuvant	7 (5.5)
Adjuvant	51 (38.0)
None	77 (56.5)

Table 3. Preoperative volume of the breasts

Group	Preoperative volume (cc)
Glandular tissue reshaping (Group 1): 69 cases	332
Reduction oncoplasty (Group 2): 17 cases	705
LD flap transposition (Group 3): 49 cases	401
Total: 135 cases LD, latissimus dorsi	413

Table 4. Specimen weights and location of the tumor according to the surgical techniques

Number breast ratio (cc)	Location of the tumor				Tumor to Nipple (%)
	weight(g)				
	UOQ(No.1) (%)	UIQ(No.2) (%)	LOQ(No.3) (%)	LIQ(No.4) (%)	
Glandular tissue reshaping (Group 1) 40.06 0.12	74 36 (49.1)	25 (33.9)	5 (6.8)	8 (10.2)	0 (0)
Reduction oncoplasty (Group 2) 101.47 0.14	21 12 (58.8)	5 (23.5)	3 (11.8)	1 (5.9)	0 (0)
LD flap transposition (Group 3) 82.54 0.2	40 11 (28.13)	6 (15.6)	9 (21.9)	13 (31.3)	1 (3.1)
Total 62.31	135 60 (44.4)	36 (26.9)	16 (12)	22 (15.7)	1 (0.9)

UOQ, upper outer quadrant; UIQ, upper inner quadrant; LOQ, lower outer quadrant; LIQ, lower inner quadrant;
LD, latissimus dorsi

Figure legends

Fig. 4. Case of a glandular tissue reshaping Glandular tissue reshaping in a 47-year-old woman with ductal carcinoma in situ in the right upper outer quadrant. The specimen weight was 32 g. A total of 60.4 Gy radiation was delivered to the right breast in the postoperative period. (A) Preoperative image (B) 2-year postoperative image.

Fig. 5. Case of a reduction oncoplasty. Reduction oncoplasty in a 49-year-old woman with invasive ductal carcinoma in the left upper outer quadrant. Tumor localization was performed preoperatively on the left breast. The specimen weight was 48 g. Reduction mammoplasty with an inferior pedicled technique was performed. A total of 60 Gy radiation was delivered to the left breast in the postoperative period. (A) Preoperative image. (B) Preoperative design. (C) 1-year postoperative image.

Fig. 6. Case of a Latissimus dorsi muscle flap transposition Latissimus dorsi muscle flap transposition in a 42-year-old woman with invasive ductal carcinoma in the right lower outer quadrant. The specimen weight was 75 g. A total of 50.05 Gy radiation was delivered to the right breast in the postoperative period. (A) Preoperative image. (B) 15 months postoperative image.

Discussion

Previous studies have shown that there is no difference in the outcomes between BCS plus radiation and mastectomy alone in early stage breast cancer.^{1,8} Some studies have even reported that BCS plus radiation appears to yield an equivalent outcome or a better survival rate than total mastectomy alone.^{9,10} However, according to a previous study, the aesthetic results were unsatisfactory in 30% of patients who underwent BCS that removed >20% of the original breast volume.¹¹ This indicates that patients who were discouraged by breast cancer surgery often have one more discouraging event of a cosmetically unwanted postoperative breast shape. To relieve their psychiatric burden, oncoplastic surgery is increasingly performed in accordance with the increasing number of BCSs. Oncoplastic surgery, as well as BCS, is another important treatment method for patients with breast cancer.

Conceptually, oncoplastic surgery involves volume displacement and replacement techniques. Considering the characteristics of Uzbekistan women who usually have big- to moderate-sized breasts unlike Westerners, forth an algorithm that recommends volume displacement techniques for excised volume <100 g; thoracoepigastric, inter-costal artery perforator, lateral thoracodorsal, and thoracodorsal artery perforator flaps for excised volume 150-350 g according to the tumor location; and LD flap for excised volume >150 g.¹² Similarly, glandular tissue reshaping, LD flap transposition, and reduction oncoplasty were performed as oncoplastic surgeries in our institution based on patients' characteristics. Glandular tissue reshaping was performed with an average tumor specimen weight of 40 g, mostly in the upper outer quadrant. When the tumor is located in the upper breast, especially in the upper outer quadrant, and the defect is not large (tumor weight <60g), glandular tissue reshaping can be performed successfully because the surrounding breast tissues are lax and sufficient to perform glandular tissue reshaping. Likewise, local fasciocutaneous flaps can be used to cover small lateral defects (<10% of the breast size), according to Clough et al.¹³ In a previous study, a local fasciocutaneous flap was required because the lesion was removed, including the skin; however, glandular flap reshaping was sufficient in our study because the skin was usually not removed.

In case of small size lower pole defect, we were also able to treat the defect well without deformation by glandular tissue reshaping. Glandular tissue reshaping method is easy to perform in upper pole defect, but with detailed surgical plan and selecting appropriate defect, it can also treat small lower pole defect well.

During the follow-up period, 2 cases of nipple areolar complex deformity and 3 cases of mild breast skin depression were observed after radiotherapy. After consultation with the patients, we decided to perform conservative treatments and regular follow up. Except these cases, nearly symmetric shapes of the breast were maintained.

Reduction oncoplasty can be an effective surgical procedure for patients who have large, ptotic breasts before surgery and have considered breast reduction. In addition, since the plastic surgeon resects additional tissue margins, this method has advantages over other surgical methods in terms of oncologic outcome. From an aesthetic viewpoint, patient satisfaction is high because patients also achieve a more beautiful and symmetrical breast than before surgery; further, chronic shoulder and neck pain owing to large breasts can be relieved after reduction oncoplasty.

In LD flap surgeries, the thoracodorsal artery is used as a pedicle, and the required LD muscle amount is elevated and transposed to the defect site. If a significant amount of the breast skin is removed, skin paddle of LD flap can fulfill the defect of breast. The disadvantage of this technique is the presence of a transverse scar at the back and increased risk of seroma in the donor site; however, this technique is useful when the volume deficit is relatively large and the breast shape might not be effectively recovered using volume displacement techniques, especially in small- to moderate-sized breasts. In this study, the mean specimen weight in the LD flap transposition was 82.54 g, and the most frequent tumor location was the lower inner quadrant. The LD flap is a common flap option for lateral, central, and even medial defects.^[14-16] This flap can contain not only the LD muscle but also the subcutaneous tissue and skin; thus,

it can cover large-sized defects well. A denervated and radiated latissimus dorsi muscle will undergo postoperative atrophy.[17] We are trying to fill the required volume mainly by regulating amount of deepithelized dermal tissues of LD flap that is relatively less atrophied than LD 10 muscles. According to Cochrane et al., patient satisfaction with cosmetic outcomes is relatively low when the breast cancer is located in the medial area of the breast.[18] In the lower inner quadrant, where deformation is likely to occur when the volume is inadequate, the LD flap method was a suitable option to reconstruct the breast almost similarly to the preoperative breast.

Recently, endoscopic-assisted LD flap transposition was introduced and used, which leaves less scarring on the back than conventional LD flap transposition.[19] Considering the tumor location, especially in the upper and lower outer quadrants, endoscopic-assisted LD flap transposition is beneficial to patients who want less scarring.²⁰ In this study, endoscopic-assisted LD flap transposition was mainly performed on the tumor at upper outer quadrant; 7 cases out of 14 endoscopic-assisted LD flap transposition cases had the location of tumor at upper outer quadrant. Owing to the limited accessibility and difficulty of harvesting, the harvested LD volume is usually slightly less than that of conventional LD flap surgeries. The mean 74.82 g specimen weight was obtained when the surgery was performed with an endoscopic-assisted LD flap in this study.

Complication results showed that the incidence of seroma (18.7%) was relatively low when compared with the complication rates of other studies. According to other studies, seroma incidence were reported to be 6% to 80% in cases of autologous LD flap reconstruction and LD-implant reconstruction.[21] As described in the previous study[22], dramatic decrease of seroma rates was confirmed when fibrin sealant and quilting sutures were used

simultaneously. According to Pogson et al[23], delaying formal shoulder physiotherapy exercises may reduce total drainage volumes. We used fibrin sealants, quilting sutures and shoulder immobilization during postoperative hospitalization period to minimize seroma rates.

Conventionally, the tumor to breast size ratio is believed to be a key factor that determines the decision to perform oncoplastic surgery after BCS. According to previous studies, declines in the cosmetic scores were noted in patients who had parenchymal resections greater than 70 to 200 cm³ or when the specimen weight to breast volume ratio exceeded 10%.[18,24,25] In our study, the tumor to breast size ratio of group 1 was 12% and that of group 3 was 20.4%. Taken together, patients who showed over 10% ratios would need to undergo oncoplastic surgery using volume displacement techniques, while those who showed over 20% ratios would need to undergo oncoplastic surgery using volume replacement techniques. Compared with the results of studies on oncoplastic surgery in Uzbeks, we found that mean specimen weights of each group of patients of this study were much smaller than those of previous studies.[12,26] In other study, the 11 mean specimen weight of LD flap was 182.6 g and LD flap was recommended in case of specimen weight over 150g.[12] However, our study showed that the average specimen weight of LD flap patients was 82.54 g. In previous studies, LD flap surgery was mainly used for only large defect, and moderate defect was covered by lateral thoracodorsal flap, intercostal artery perforator flap, thoracoepigastric flap, and thoracodorsal artery perforator flap.

Since the volume of LD flap was determined by controlling the amount of dermal tissue, flap volume was precisely adjusted according to the degree of severity in this study. Therefore, we were able to effectively reconstruct moderate size defects as well as large defects.

In conclusion, the glandular tissue reshaping method was suitable for small defect with a mean specimen weight of 40.06 g and tumor weight to breast volume ratio of 12% . It was easy to perform the operation when the defect was located at the upper pole. LD flap surgery was performed with an average specimen weight of 82.54 g and tumor weight to breast volume ratio of 20%. In case of defect of lower inner quadrant, reconstruction using LD flap may be more necessary, and LD flap can be effectively used in reconstruction of all site defects of breast.

For plastic surgeons who reconstruct breasts, Consideration of specimen weight and tumor location is very important for reconstructing breasts naturally and symmetrically. We expect that this study will be helpful in determining the optimal method of oncoplastic surgery.

There were a few limitations in this study. First, we did not consider the frozen section specimen weight. Sometimes, frozen section analysis is performed two, or even three times when the resection margin is proven positive for cancer. However, we could not calculate the frozen section specimen weight; thus, we only considered the permanent tumor specimen weight. If the frozen section margin weight was taken into account, the average weight of the specimen would have also increased. Second, the study has a relatively small sample size. More than 100 patients were included in this study; however, after sorting data according to the tumor location and surgical method, each group had a relatively small sample size. Because of small sample size of each group, we had difficulty in performing statistical analysis. If larger sample sizes were included in this study, more obvious differences could have been noted and more reliable statistical analysis could have been performed. Third, mean follow-up periods were short and survey of aesthetical satisfaction was performed at a point not far after the completion of radiation therapy. Survey was mainly performed by the patients who visited 12 out-patient clinic at postoperative 12 months. After radiation therapy, changes in breast shape and volume may occur over time more than 1 year. If we conducted satisfaction surveys after two years of surgery, I think we could have some more credible results.

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